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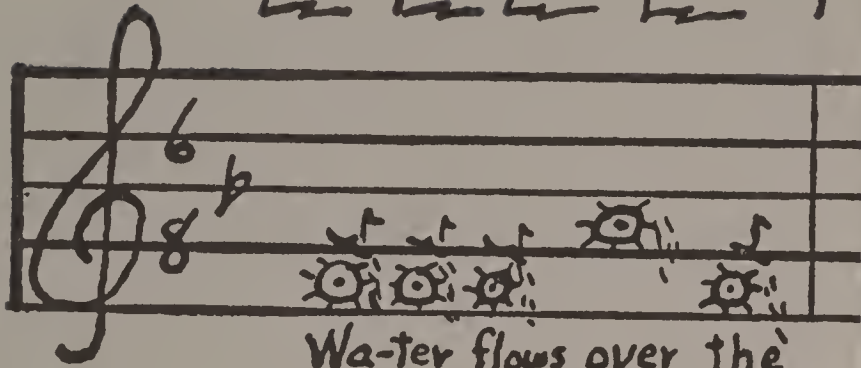
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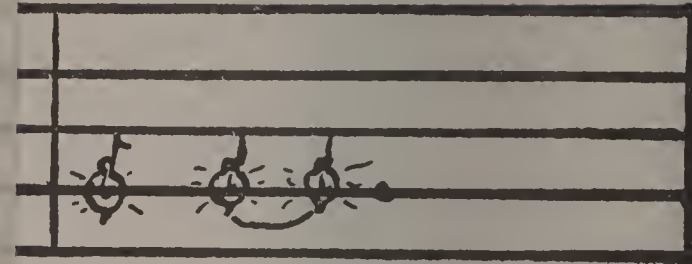
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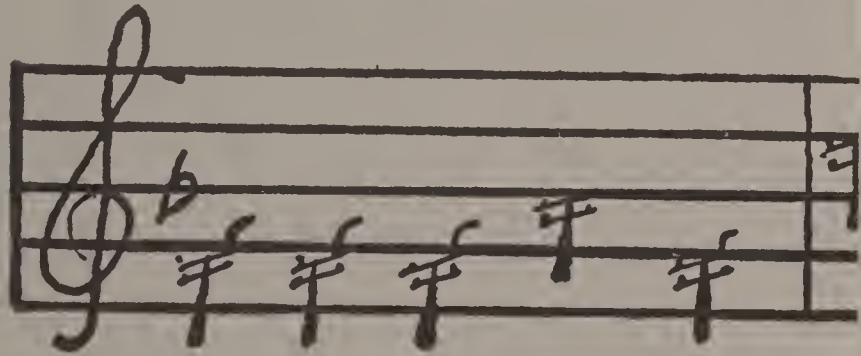
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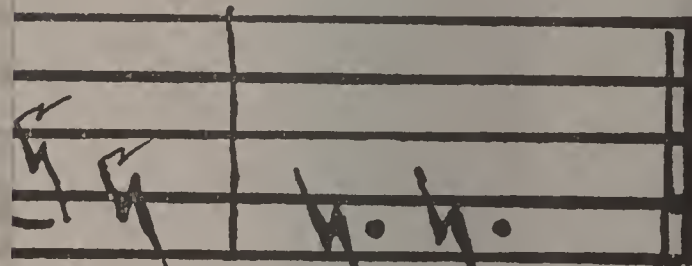


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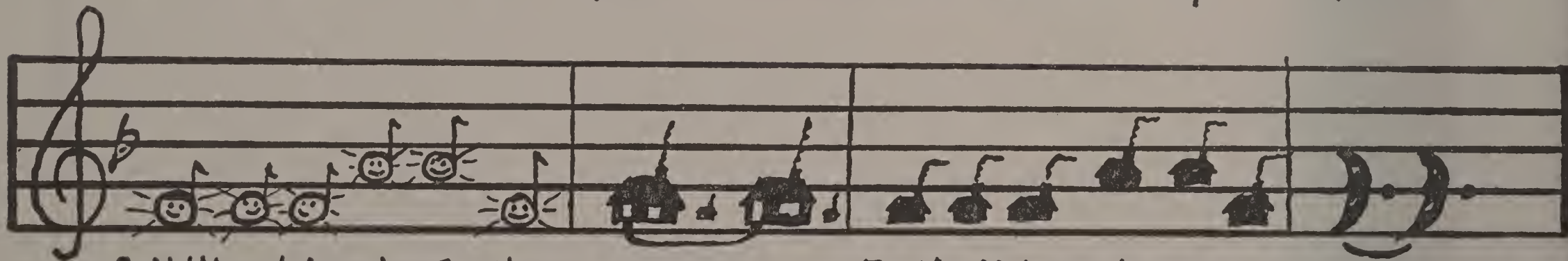
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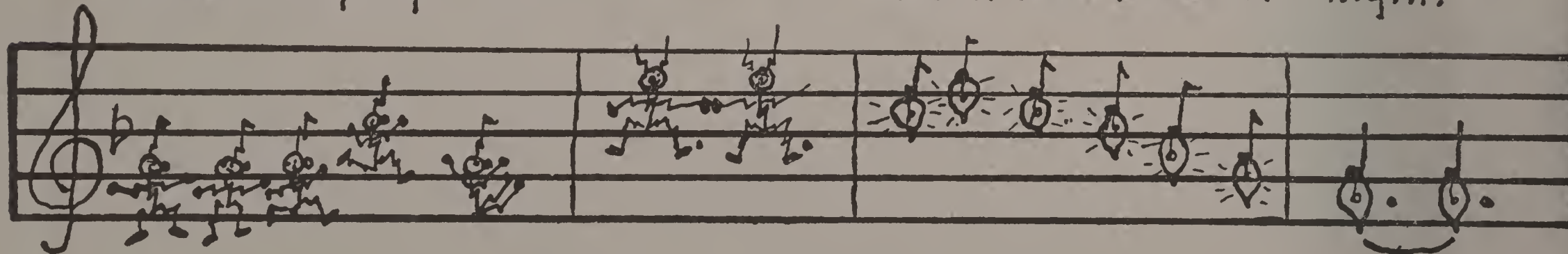
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All from a Ti-ny spark.



Switch'd on brings day To the room - - -. Turn'd off leaves dark-ness of night.



A rea-dy ser-vant here - - -. This is the mag-ic of light.



SPARKS AND LITTLE SPARKS

By
RUTH and HARROP A. FREEMAN

Authors of
CHIPS AND LITTLE CHIPS, CAPTAIN AND MATE

Pictures by
ROBERT N. BLAIR



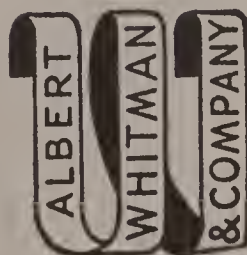
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SPARKS AND LITTLE SPARKS

WE must have our new house carefully wired for electricity, Son. Sparks Russell is the electrician who is going to do the work. You can watch him the same as you did Chips the carpenter, when he built the house. Perhaps Sparks will show you how to wire your playhouse."

"That will be fun, Father, and I will learn about electricity and wiring."

Sparks Russell had formerly tended one of the large generators at the power plant. A generator is a machine that makes electricity. Sparks left the power plant to wire houses and to do general electrical work.

When Sparks came to the house the little boy said: "Father called you Sparks. May I call you Sparks?"

"Yes, you may call me Sparks. May I call you Little Sparks?"

"I would like to be called Little Sparks. I would like lights in my playhouse. Will you show me how to wire it?"



Sparks said: "You may watch me wire the big house. When you see how that is done, I will show you how to wire your playhouse. Before I start wiring the house I must go to the electric company for some material. If you will come with me I shall show you how electricity is made and how it comes to you."



Little Sparks ran to Sparks's truck. He wanted to know more about electricity. He did not understand how electricity could light a room when he could not see the electricity itself.

Sparks and Little Sparks went through the power plant. It was a hydraulic plant. A hydraulic plant is run by water from a falls or a dam in a river. Some power plants are run by steam. Sparks explained

that water or steam is carried by pipes called penstocks and discharged against a wheel with blades on it like a windmill. This wheel is called a turbine. The water or steam turns the turbine as wind turns a windmill. The shaft of the turbine is attached to a generator. A generator is like an electric motor run backward. Instead of using electricity it manufactures it.



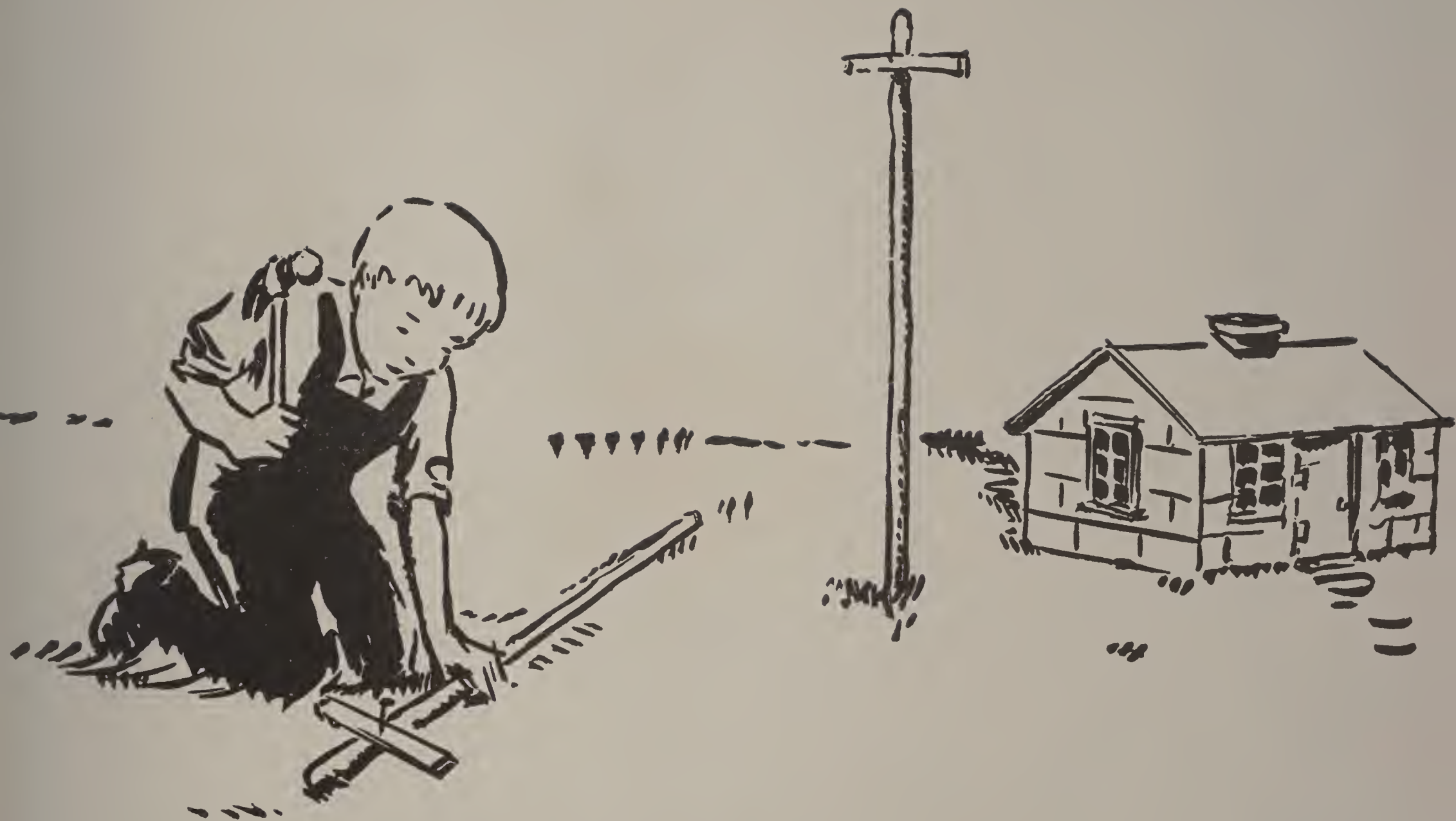


When Little Sparks came home he made a little turbine. He fastened small tin cans to the rim of an old cartwheel. He held the garden hose so that it squirted into each can. The water dumped out of each can as it came to the bottom. The wheel whirled around and around.

On the way home from the power plant Sparks had showed Little Sparks the electric light poles and wires. He showed him the transformers high on the poles. He explained that the wires carried alternating current at high

voltage. Voltage is a way of measuring the strength of electricity. Alternating current is electricity that goes on and off like the ticking of a watch, fifty times a second. We cannot see it go on and off. The transformers change the higher voltage to a lower voltage so that it can be used safely in a house.





At home Little Sparks cut off some old broomsticks. He nailed a piece of wood across the top of each. He drove the broomsticks into the ground near his playhouse. These were his electric light poles.

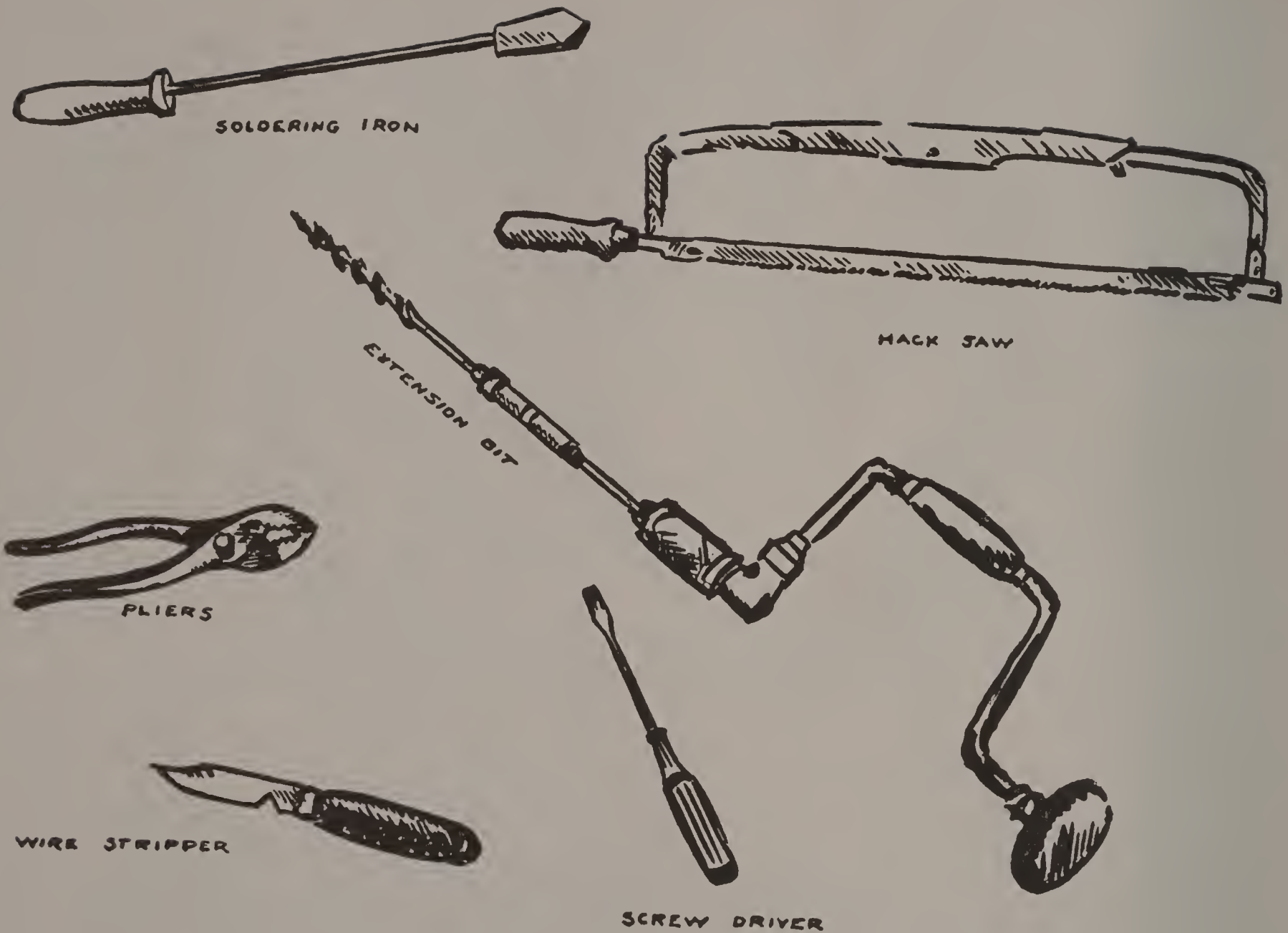
Little Sparks asked Sparks to show him what materials and tools he would use. Sparks went to his truck and returned with rolls of wire, black tape, cable, little iron boxes, and switches. The cable is a covering for the wire where it runs inside the walls. The iron boxes are fitted into the wall to enclose the switches.

Sparks also brought in his tool chest.





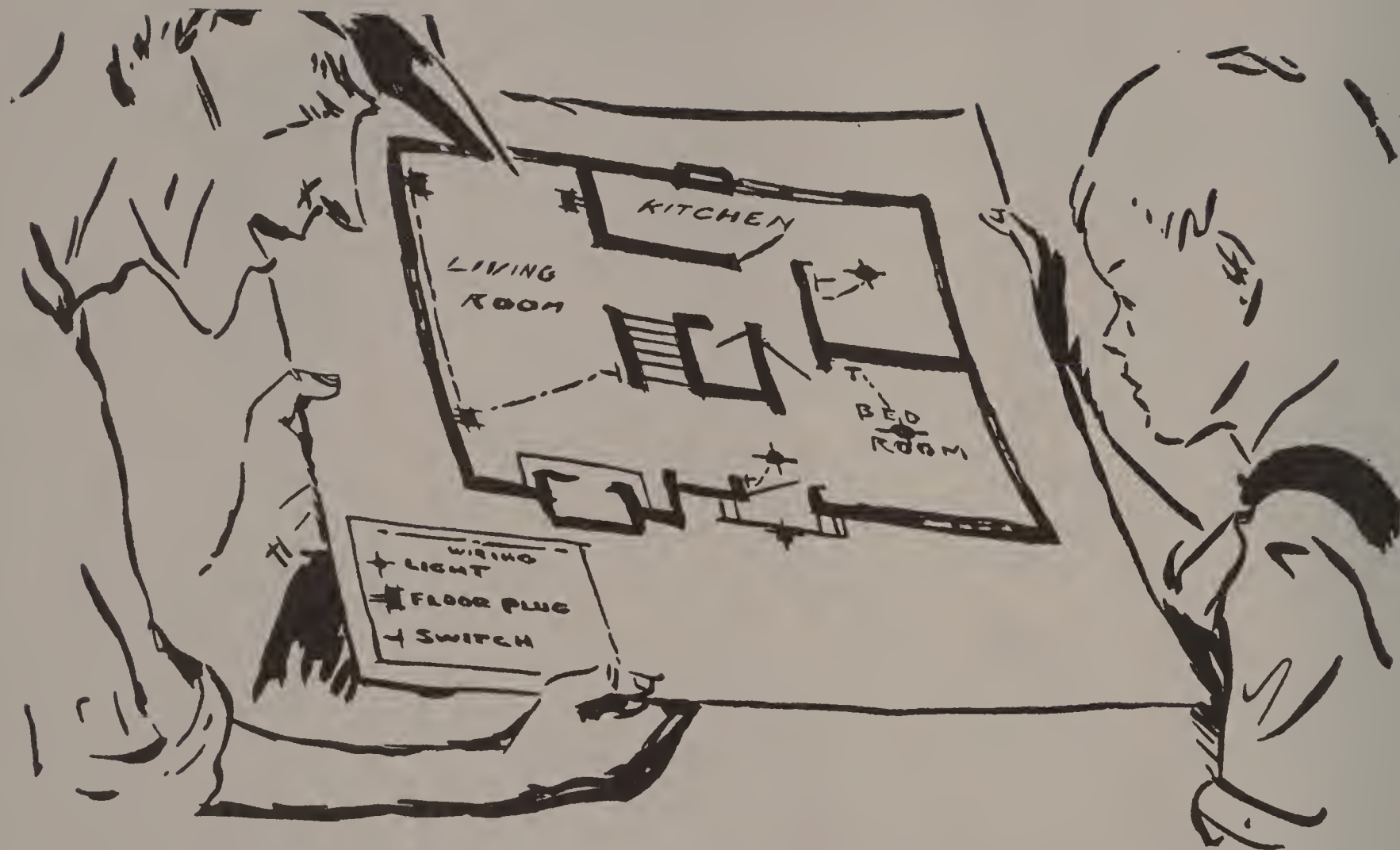
Sparks gave Little Sparks some bell wire, two dry cell batteries and some little sockets with flashlight bulbs in them. Little Sparks put the batteries near his playhouse and turned a box upside down over them. This was his powerhouse.



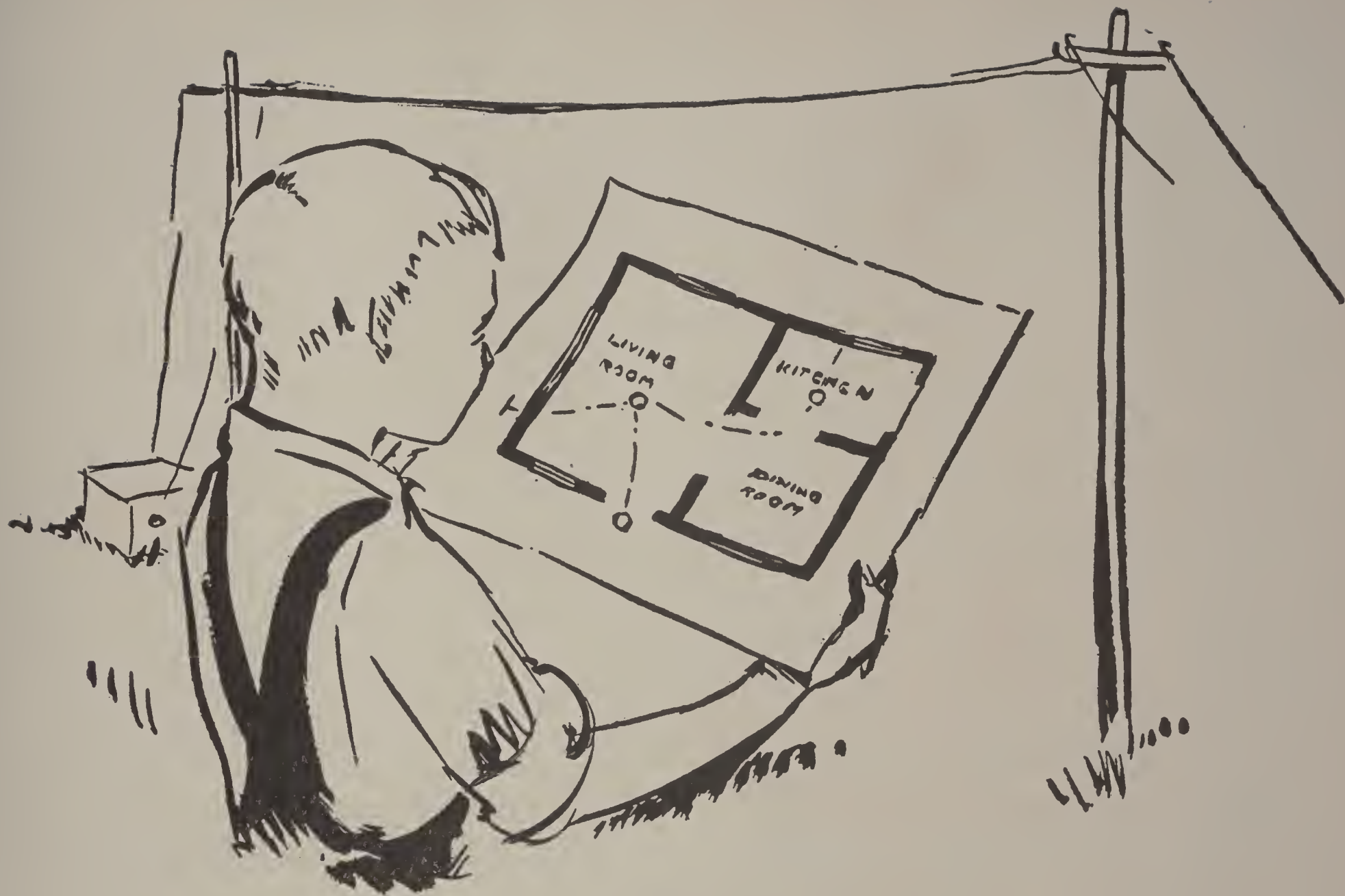
In Sparks's tool chest there were tools different from those of Chips the Carpenter. There were extension bits, pliers, soldering irons, hacksaws, and wire strippers.



Little Sparks used a hammer, pliers, box of brads, and brace and bit. He got these tools from his basement work bench. The dry cell batteries each had two bolts on top. One was marked + or plus charge, and one was marked — or minus charge. Little Sparks connected a short wire from one + to one —. Then he connected one long wire to the other + and one long wire to the other —. These two long wires he strung along the poles to his playhouse.

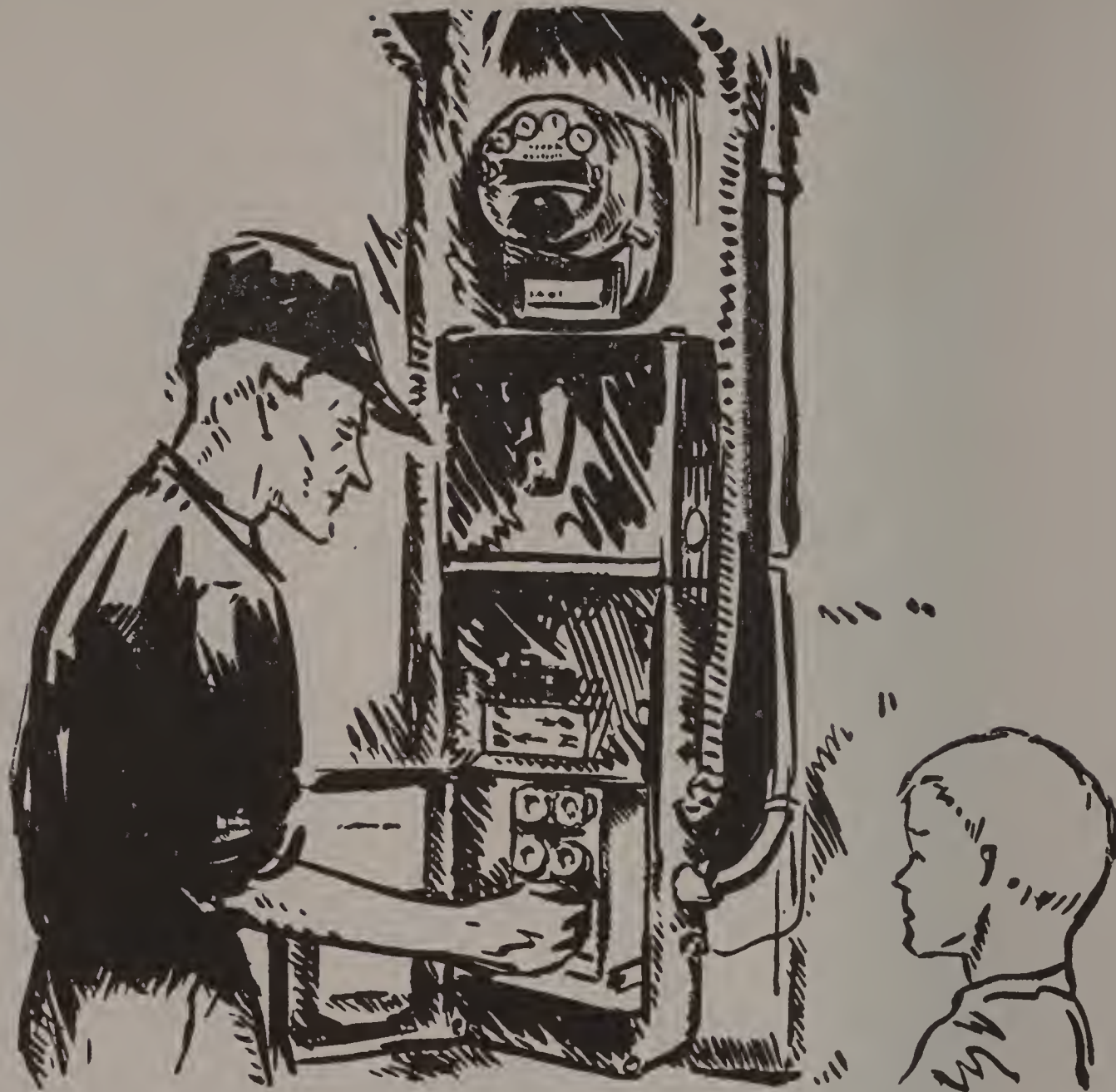


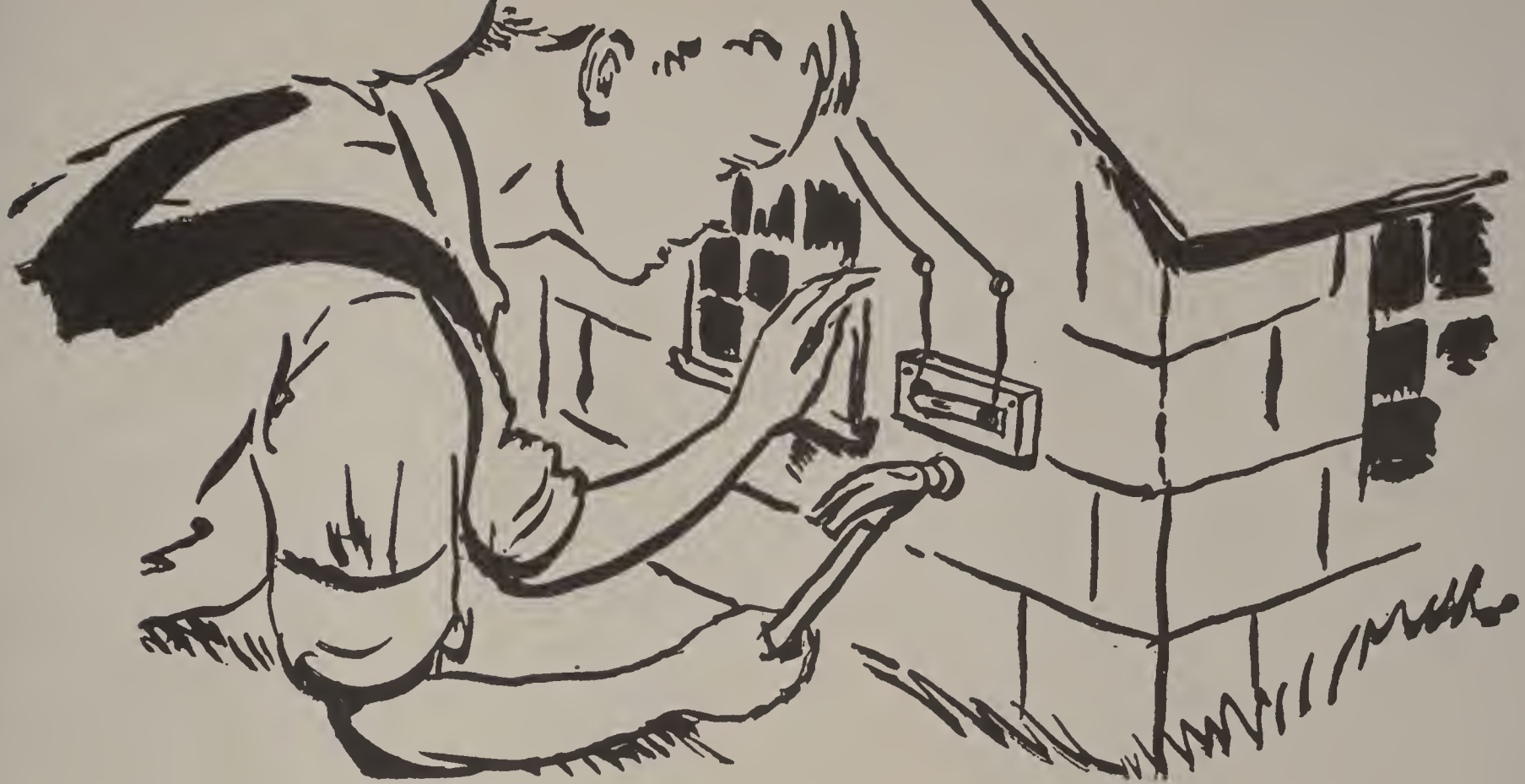
The electrician has a plan for his work. This is shown by symbols on a house plan. Sparks explained the symbols to Little Sparks by writing the meaning under each symbol. Each electric outlet is connected into a circuit. An ordinary house has three or four circuits.



Sparks drew an electric plan for Little Sparks's playhouse. It showed two lights inside the house, and a switch and one light outside. Sparks showed him how to make a switch.

Sparks connected two heavy wires to the electric line which the power company had run to the house. These heavy wires Sparks ran through a conduit pipe into the basement. At the end of these wires he installed a meter. A meter measures how much electricity is used in the house. He installed a switch box so that all the lights in the house can be turned out. He put in a fuse box. There was a fuse for each circuit. If anything went wrong with any circuit it would blow the fuse in that circuit and not hurt the wiring.





Little Sparks put two small bolts through holes in the side of his playhouse. He fastened the two wires from his poles to these. He cut a strip of tin. He bored a hole in one end. He put a bolt through this end and through a little block of wood. He connected one of his long wires to this bolt. At the other end of the block he put another bolt. He connected a wire from this bolt into the playhouse. When he swung the end of the strip of tin against this bolt the electric current flowed through the wire. When he swung it away the current was turned off.

Sparks bored holes through the floor joists of the house and ran wires from the fuse box to all parts of the house. These wires ran inside a cable. This cable was connected to the ground. If a bare wire touched the cable, or a box, the



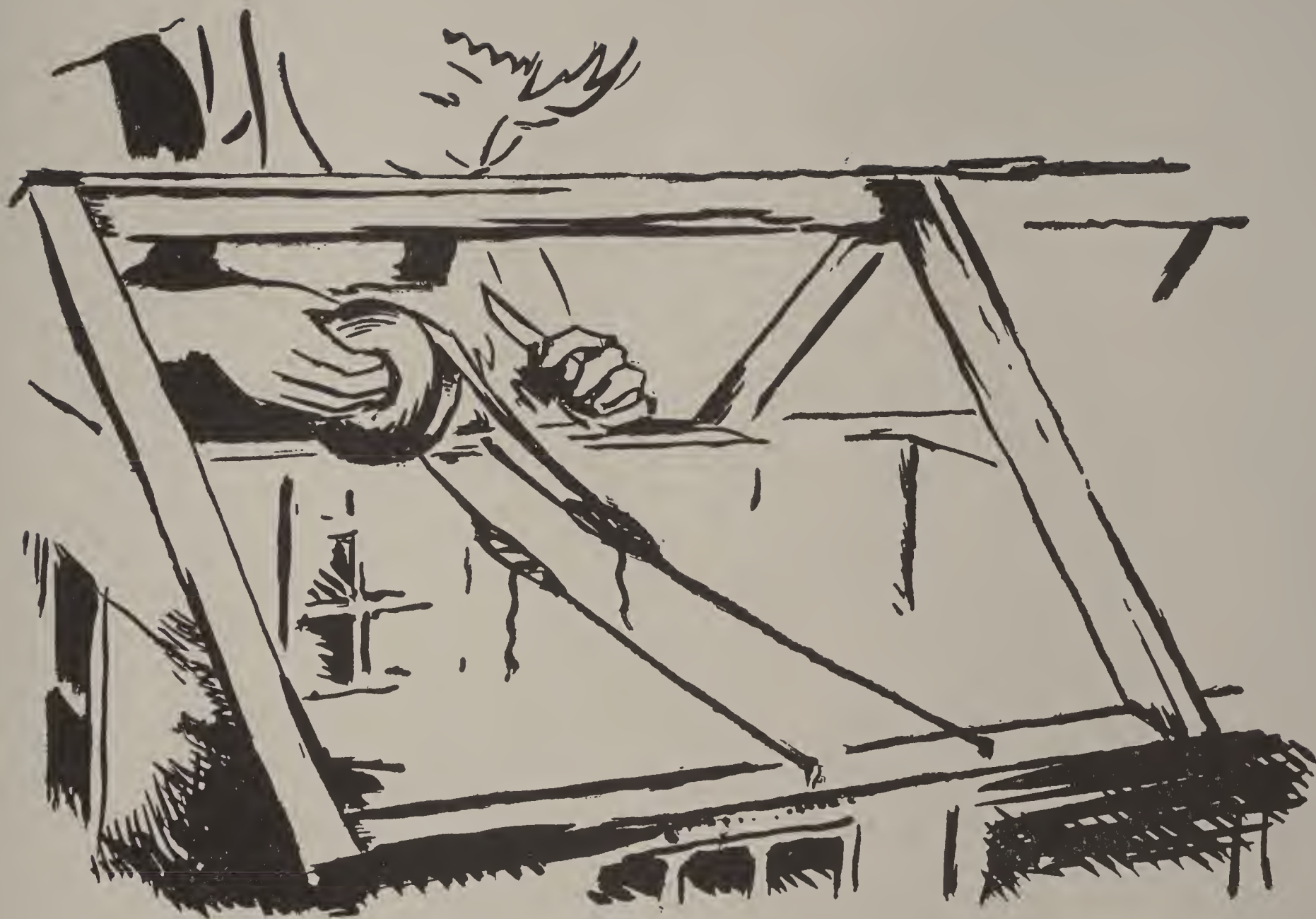
current would flow into the ground. It would not hurt anyone. Where there was to be an outlet he cut his wires and left them hanging. Later he would put small metal boxes at each place. When Sparks spliced a wire he soldered the joint and covered it with friction tape.



Little Sparks had made the roof of his playhouse so it could be taken off. He ran two wires along the ceiling of the rooms below. He used small brads to hold the wires in place. He ran two short wires outside the front door.



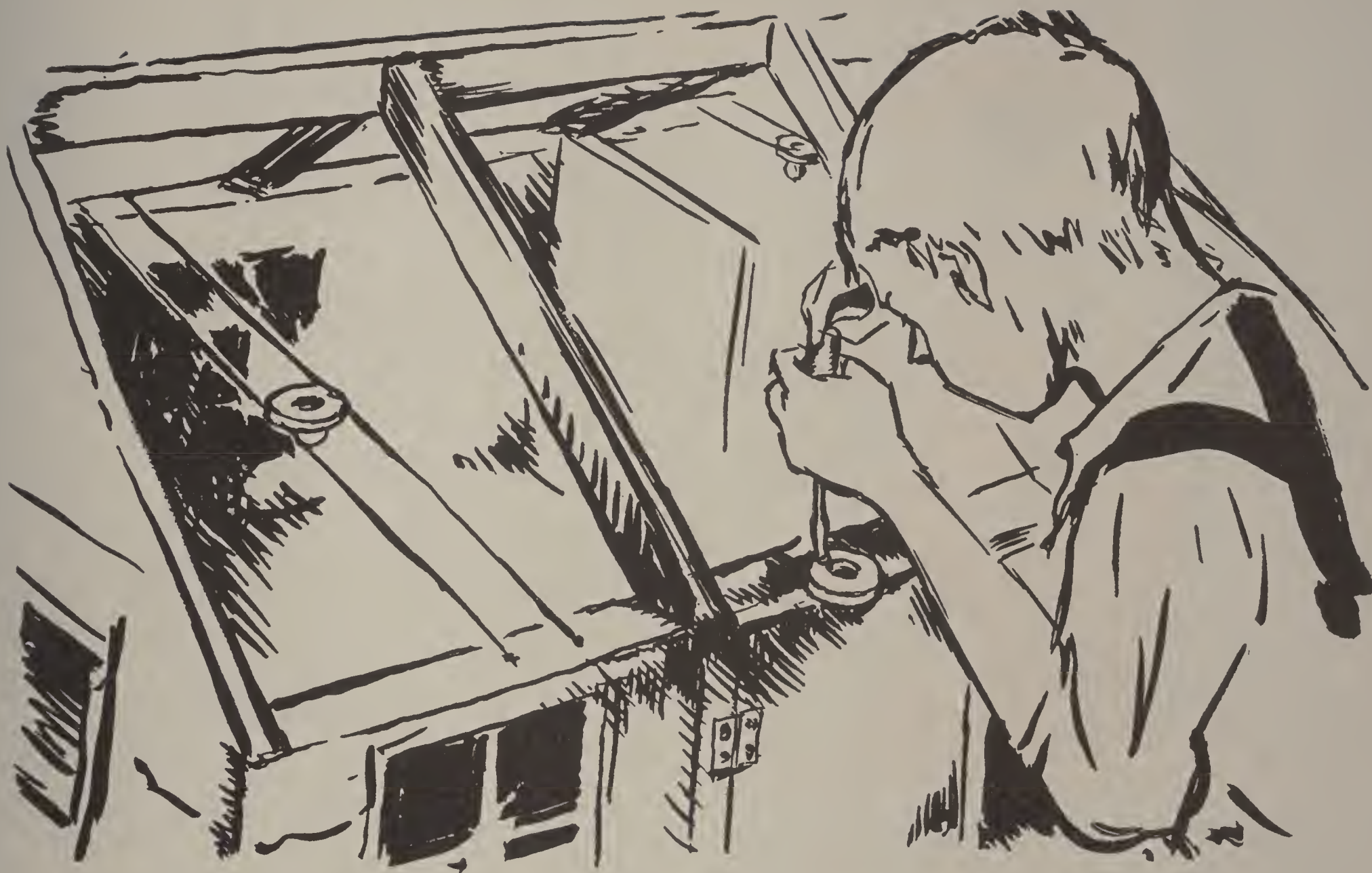
Sparks fastened little metal boxes at each outlet. He brought the cable and wire into each box through holes in the side of the boxes. The boxes for switches and plugs were square. The boxes for ceiling lights were round. The switches or ceiling lights would cover the boxes when the house was finished.



Little Sparks did not have boxes for his outlets. He spliced very short pieces of wire to each of the long wires where his lights were to be. He carefully taped each joint.



Sparks next installed the switches, plugs, and light fixtures. Where he connected the wires from the fixture to the wires in the box he covered the joint with a nipple. A nipple is a piece of hard rubber that looks like Mother's thimble.



Little Sparks installed his light sockets. There was one in the living room of his playhouse. There was one in the kitchen. There was one above the front door. He screwed the flashlight bulbs into the sockets.



Sparks installed a separate circuit for the electric stove. This used 220 volts. The lights in the house used only 110 volts. He used heavy wire for this circuit. He connected the stove by a heavy plug in the base board. He explained what caused the stove to heat. When the electric current flows through a wire that resists the current the wire gets hot.



Little Sparks said: "I wish I had a stove for my playhouse."

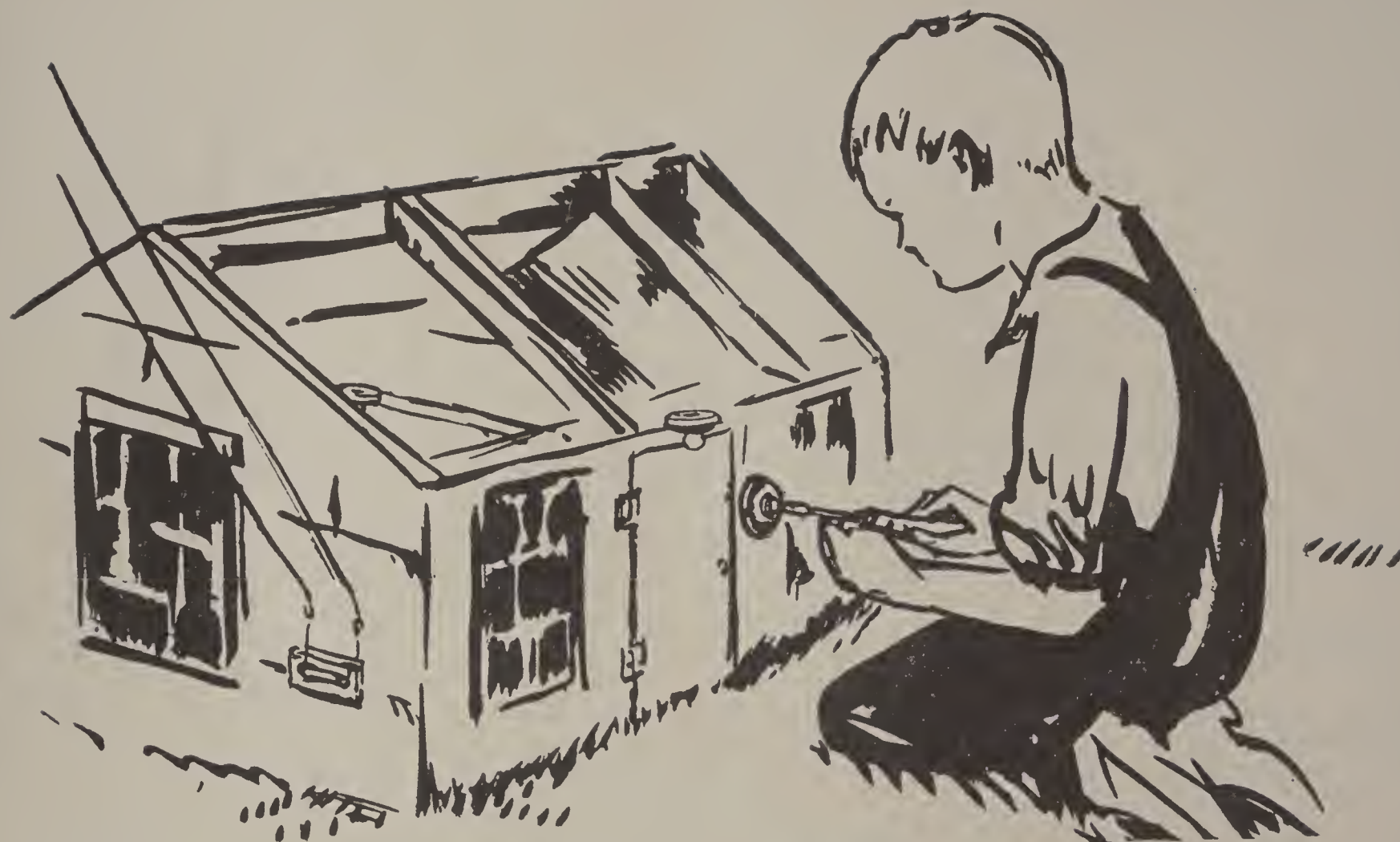
"You can make one," said Sparks.

Sparks gave Little Sparks a piece of curly resistance wire. He gave

him a porcelain insulator. Little Sparks wound the wire around the insulator. When he attached this to the wires in his playhouse it got hot. This was his stove.

Sparks was nearly finished. He must connect the door bells. He put a small transformer, like an electric train transformer, in the basement. This cut the voltage down to six volts for the bell. He fitted a small push button at the right of the front door. When the button was pushed a chime rang. He put a pushbutton to the right of the back door. When this button was pushed a buzzer sounded. One could tell by the sound whether a person was at the back door or the front door.





Little Sparks got a pushbutton and a buzzer from Sparks. Sparks showed him how to connect these into his battery circuit. He ran a wire from his switch to the pushbutton. He ran a wire from the pushbutton to the buzzer. He ran another wire from the buzzer to the wire outside the playhouse which was not connected to the switch. When he pressed the button the buzzer sounded.



When Sparks had finished his work he carefully wiped every tool and put it back into its place in his tool box. He coiled the wire that was left. He gathered up all his material and put it in a box.

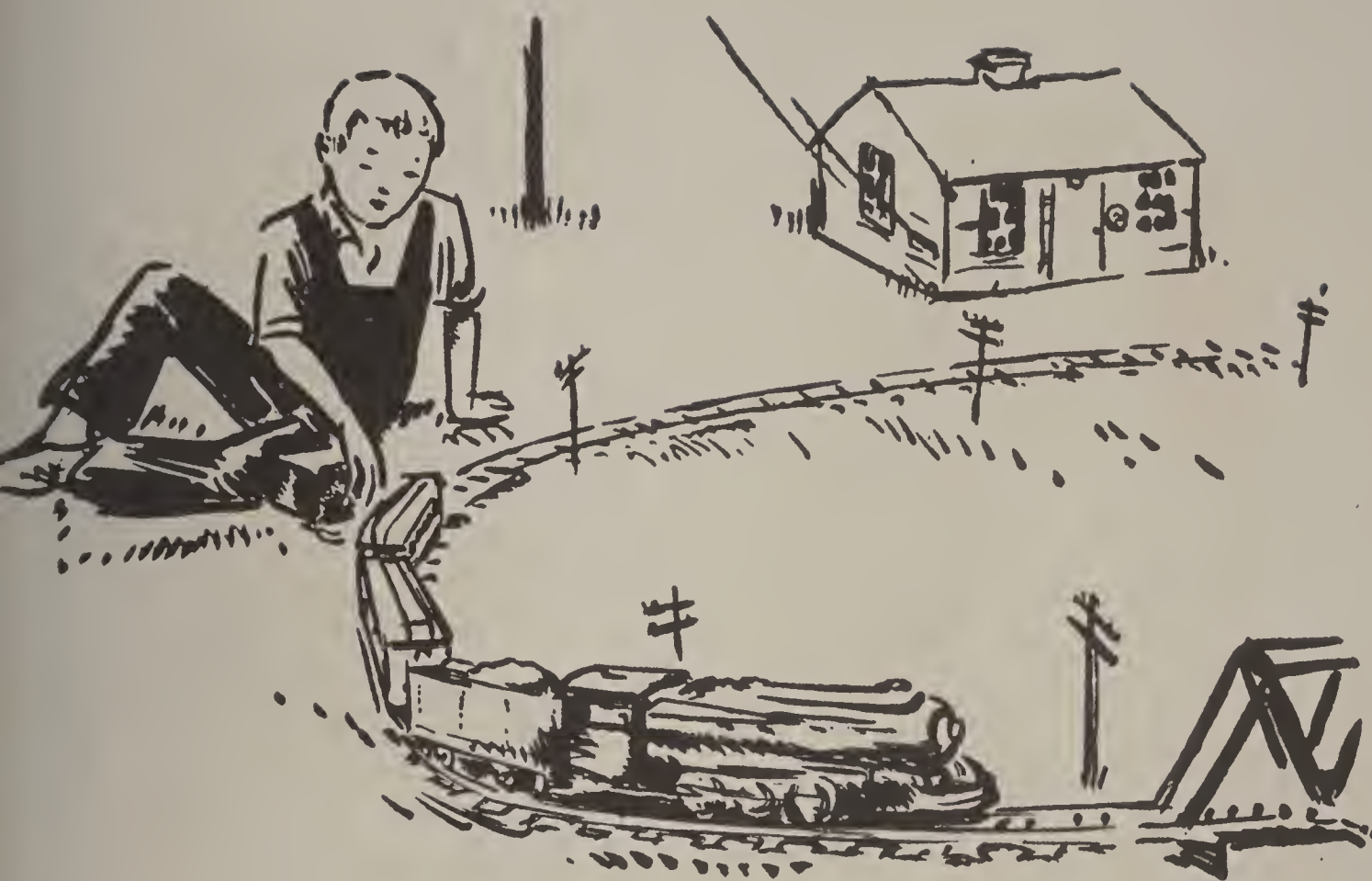


Little Sparks also gathered up all his tools. He carefully wiped each tool. He hung each tool in its place over his work bench in the basement.

Sparks sat down with Little Sparks before he went. "I have left an extension outside the house for you. You may wish to use your electric train. I am proud of my job. Electricity is a great friend. Installing electricity is a great service.



"Electricity can hurt you as well as be a friend. Use electricity for what it is intended. Never fool with it. Never stick anything into a socket or plug. Never touch a bare wire that may be connected."

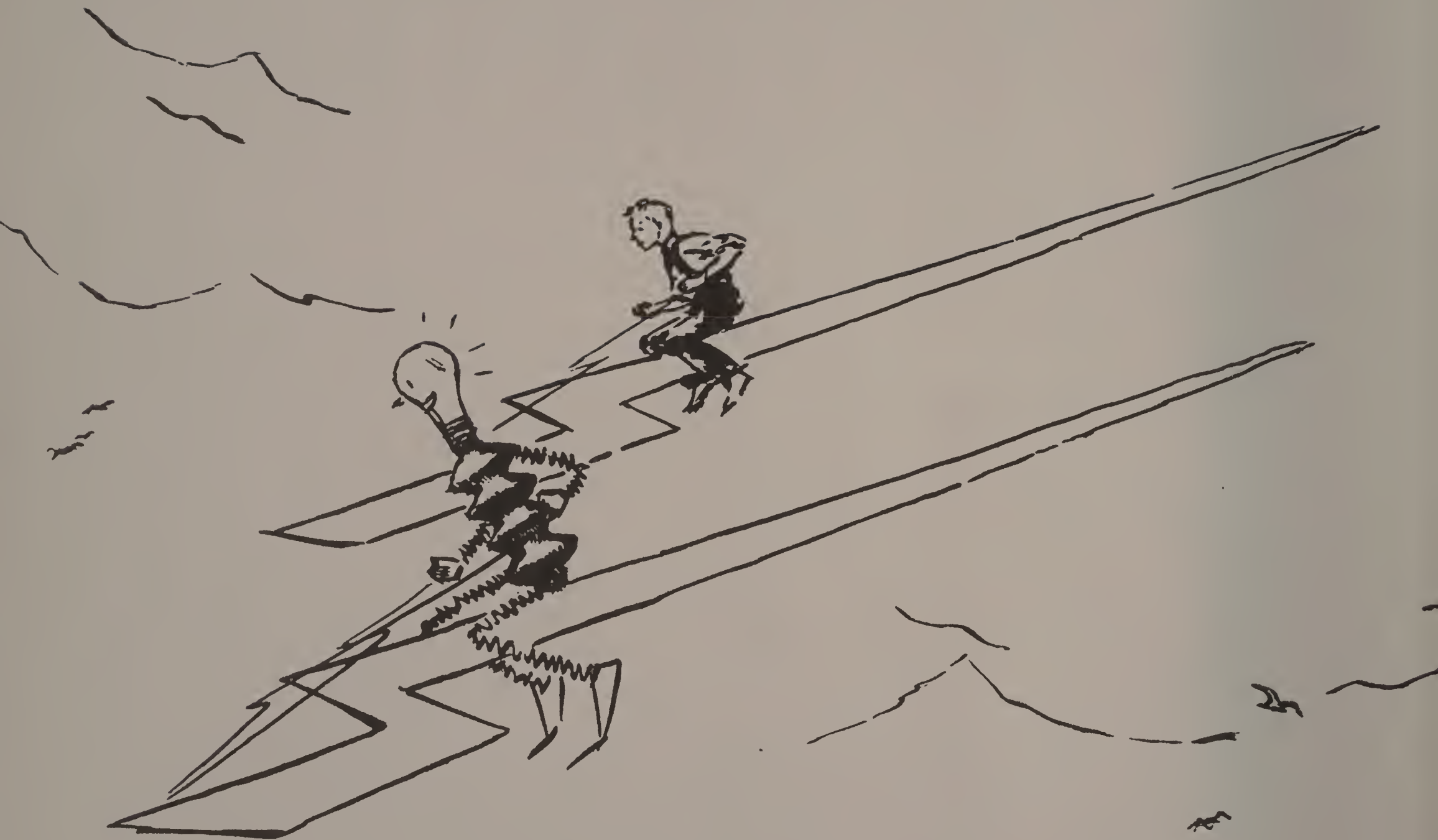


Little Sparks connected up his electric train to the extension Sparks left outside the house. He knew now that the electricity passed through

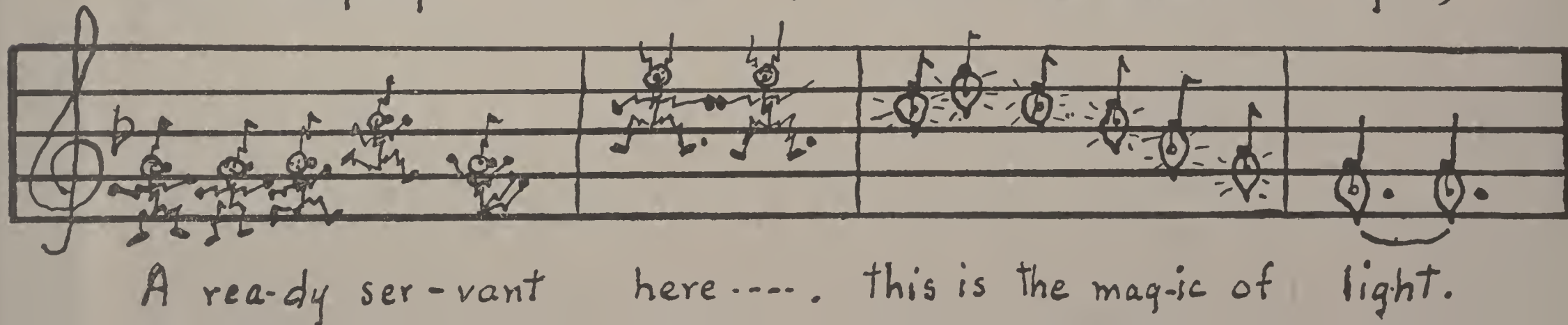
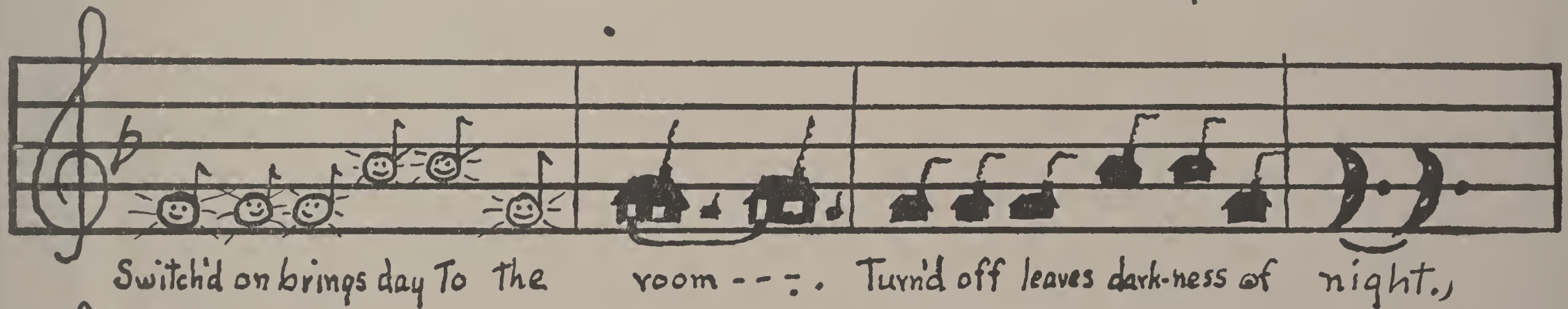
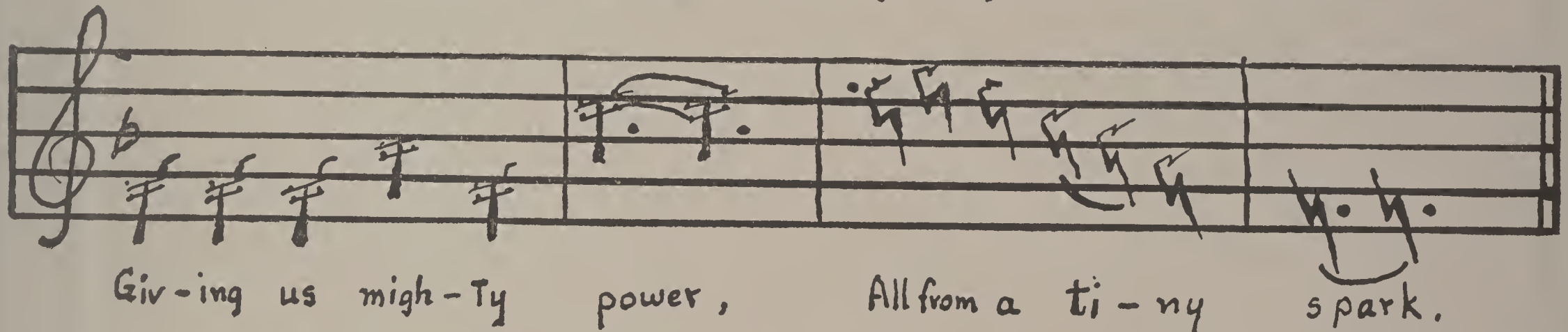
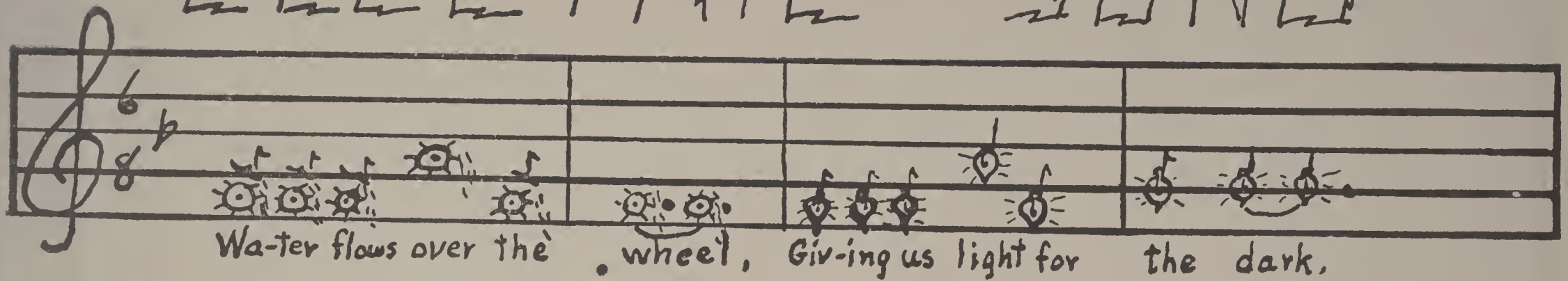
a little motor inside the engine. When he turned off the switch the electricity stopped going through the motor and the train stopped. The train ran past his playhouse. It was fun to stop the train near the playhouse to take on and let off passengers.



At night Father turned on all the lights in the big house and Little Sparks turned on the lights in the playhouse and in the train. This is how it looked from the street.



ELECTRAIC SONG



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